

# PROCESS CONTROL SYSTEMS FOR THE PLASTICS PROCESSING INDUSTRY

Precise. Innovative. User friendly.



[www.nolden-regler.de](http://www.nolden-regler.de)

**NOLDEN**  
**REGLER**®

Since 1975, NOLDEN controllers are known for precise temperature control in the plastics processing industry. Originated from a small development company for high quality laboratory controllers, NOLDEN designs and produces today precise process control systems mainly for hotrunners and injection moulds. Starting with temperature control in the hotrunner, more and more additional process control, diagnosis and monitoring functions were added – that’s how NOLDEN brings you today the whole mould control in just one device. This simplifies a lot the operation and wiring and saves precious space around the injection press. In many cases - as for the neural control algorithm „evoControl®“ or the mould testing device „MouldExpert“ – NOLDEN was the trailblazer for new, innovative technology, shown by numerous patents and industrial property rights. More and more, well known OEM-customers rely on our know-how and get their devices developed and produced by NOLDEN.

## NOAH & CLARA

Our latest innovation: NOLDEN NOAH & CLARA is the solution for the most complete process data tracing, even many years later. This all fail-safe and remote accessible from any trusted device all over the world – get more news on the following pages.

As a development and production company, we want to be at your service from the very beginning. This starts with individual support to find the best suitable control system, of course with thorough testing cycle in your production environment. Also for future upgrades and function enhancements as well as service and repair – we would like to be your partner for the whole life time of your device.

Kind regards,  
**Hans Werner Müller**  
 Owner and CEO



*Hans Werner Müller,  
 Owner and CEO*



*Uta Plätzer,  
 Customer service  
 and administration*

*Our premises  
 in Meckenheim*

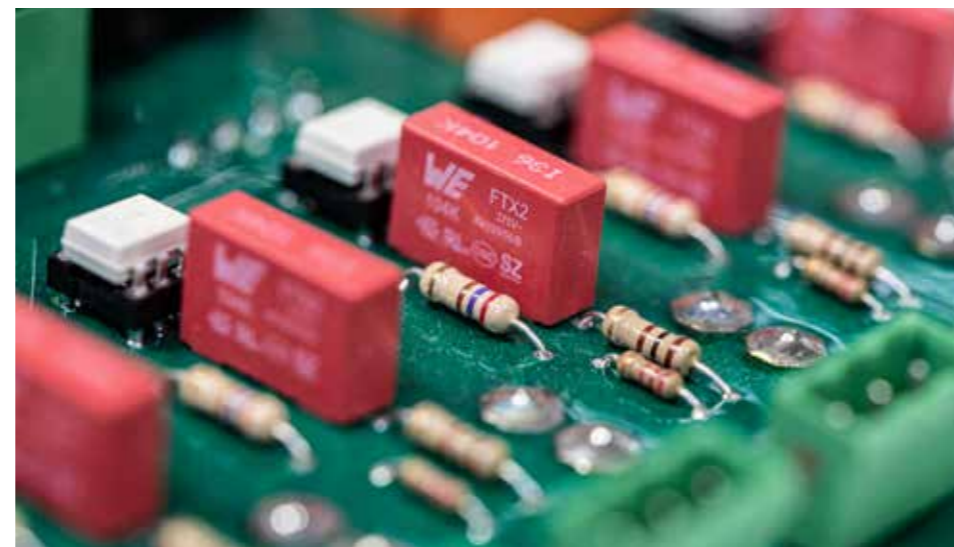


# SINCE 1975 AT YOUR SERVICE IN THE PLASTICS PROCESSING INDUSTRY

*Assembling and wiring  
 of our control systems*



*Electronics development, circuit board  
 design and production are made by  
 NOLDEN in-house – the only way to  
 guarantee high quality, functionality  
 and durability.*



*High quality master-batches made from technical composites – this is where everything begins. Until obtaining dimensionally accurate parts with complex functions and perfect visual appearance, you need experience – and perfect process control.*

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## INNOVATION BY NOLDEN

### NOAH & CLARA



#### Our solution for highest flexibility and security in process data tracing

This problem is well-known to everyone in the plastics processing world: Even more complex production processes, even higher customer demands for process data tracing for longer periods of time. On the other hand, operation must remain manageable and – last not least – cost should be taken care of. Of course, storage of your precious data must be safe and reliable for years to come.

Impossible? Of course not, that's how the new NOLDEN team comes into the picture, NOAH and CLARA take care of your needs!

What does this mean? CLARA is the abbreviation for **CLoudRedundantArchive**, this is the technology inside your unit on the spot. CLARA consists of several data-bases for an automatic intermediate data storage for several hours or even days – internet connection may be broken without previous notice. NOAH (**Nolden OperationalArchiveHub**) is the safe harbour for your process data in a NOLDEN private cloud, or even in your company cloud, if you wish.



How much does it cost? There's an easy answer, nothing at all in the beginning! CLARA comes standard in our new units NR8000-v3, no extra charge. If you do not wish to make use of the data tracing functionality, that's it, current data are overwritten periodically. If you then opt for NOAH, reasonable monthly fees will be charged, depending on the number of data and storage time. No need to take that decision right now, with our new generation of controllers, internet connection may be made years later. Of course, data storage only starts from cloud connection time on.

Process data in injection moulding require a lot of memory, depending on the number of hotrunner zones and/or additional data as e.g. cavity mould pressure monitoring, several terabyte per years are quickly reached. Way too much to be stored inside the device, safety issues and protection against un-

lawfull access come on top. Finally, data retrieving would have to be done on the spot, not practical if the unit is located in your Chinese or Mexican plant.

### DATA WAREHOUSING OF THE FUTURE

Almost all international banks and payment services trust since long time in their own cloud storage systems, managed by professionals, fail-safe and protected against unlawful access. After all, data storage is very energy consuming, that's why NOLDEN has chosen a cloud provider located in Scandinavia, where data warehouses are typically fed with environmental friendly energy from hydro powerstations. This is also cost efficient, not a disadvantage for your as a customer. Data retrieving can take place from all over the world by trusted devices.

# NOLDEN evoControl®

## A quantum leap in control technology

*That's how mother nature assures control: A network of neurons exchanges information as small stimuli and determines control reactions in a very precise manner.*

In the field of plastics processing, it's very often temperature to be controlled precisely, as it is of great significance for the viscosity and thus process behaviour of molten plastic aggregates. Here, mostly so-called PID controllers are used, which combine Proportional, Integral and Differential behaviour to calculate the needed heating power adjustments. Alas!, this proven method features two big disadvantages, as everyone working in the plastics business knows well.

**1. OVERSHOOT:** Before stabilizing at the desired setpoint, temperature over- and undershoots several times, they also say: "The controller gets tuned".

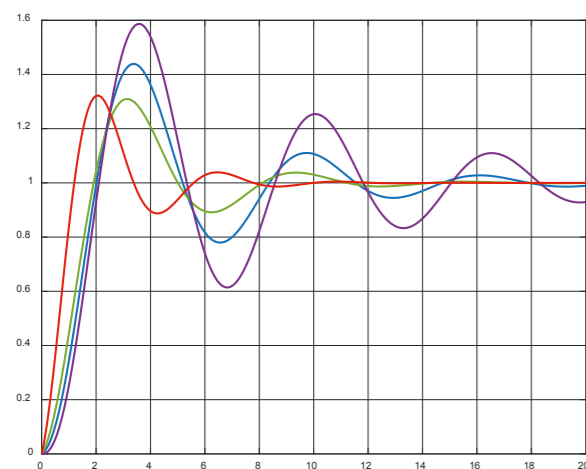
**2. COMPUTING PID-VALUES:** To work precisely with a given hotrunner or mould, one must program the controller with the appropriate P-, I- and D-parameters. This should be done preferably without the interference of the operator, therefore, several so-called self-optimizing or "autotuning" methods exist. In many cases, this works properly and the temperature remains stable, in other cases, it doesn't and the process is oscillating up and down. This is just what you don't need in the plastics transformation business!

That's why numerous attempts were made to overcome those drawbacks. NOLDEN engineers and research people looked for a completely new approach and found it in nature. In biology and neurochemistry, control operations are performed by so-called neurons, combined to huge networks. Every single neuron only performs a limited part of the total operation, the precision of the overall result is obtained by the number of neurons in the network. In addition, a fundamental advantage of neuronal networks is their ability to get "trained", the propagation parameters of every neuron can adapt themselves to prevailing circumstances.

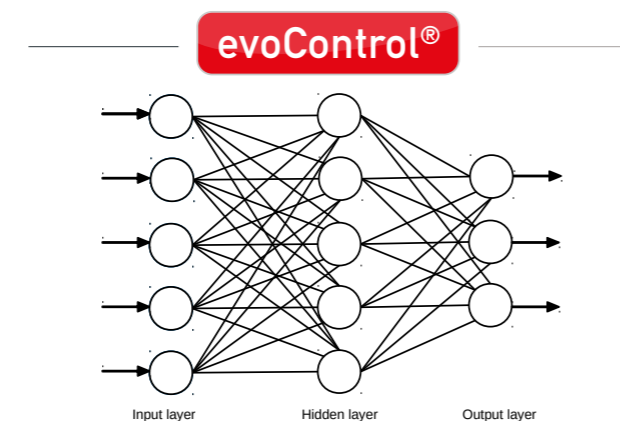
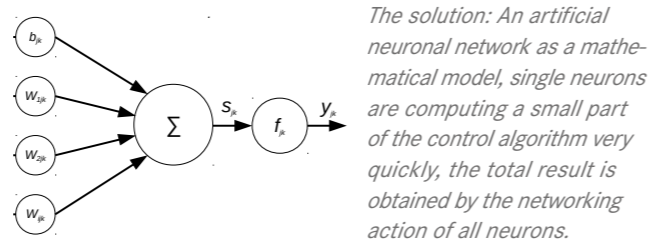
Artificial neuronal networks have been scientifically investigated in the recent years, they were mapped into mathematical models and used to describe complex, dynamic processes. NOLDEN was first to use those models to control temperature within the plastics processing industry and is proud to present with NOLDEN evoControl® the first process control system without any overshoot. evoControl® is patented for NOLDEN.

### Problem

*This problem of conventional PID-control is well-known to everyone in the plastics processing world: Strong overshoot of actual temperature depending of the responsivity of the hotrunner or mould. One can attenuate it, but not completely suppress it.*



### Solution



# NOLDEN MouldExpert

## Compact mould testing device for electrical hotrunner elements

### APPLICATION

NOLDEN MouldExpert checks the pin assignment of any arbitrary 24- or 16-pole mould connector, identifies the different elements (heater or thermocouple) and shows their operational state and characteristics. Shortage to ground on one of the pins is identified and indicated as well. The testing result is displayed on a large, bright colour touchscreen and may be downloaded as an EXCEL file via USB-plug.

### DESIGN

Measurement electronics and high contrast 7" touch-display are mounted in a rugged, portable plastic casing. The device is driven by a set of rechargeable batteries, which allows to be carried to any location. Charging takes place with a standard USB-C charger on any house-hould wall plug.

### FUNCTION

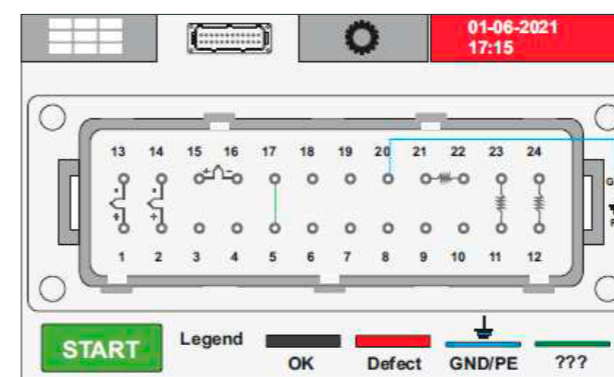
MouldExpert is a fully automated multimeter, which measures every connector pin against every other pin as well as against earth. If a thermocouple or a heater is identified, the correspondant electrical symbol is drawn graphically between the associated connector pins on a picture of the chosen connector. In case of an earth shortage, a line from this pin to ground is drawn. All results can also be displayed as a table, in this case, beside the electrical symbol, resistance (Ohm) as well as power (W, A, rated to 230V) is depicted in case of a heater. This table can be exported with one push of a button as an EXCEL-file (csv) via the build-in USB-socket. One 24-pole or alternatively one 16-pole connector cable comes stan-

dard with the device, others are available on demand. Nevertheless, the number of measurement channels is limited to 24 + Ground.



- Battery driven, can be used far from electrical power supply
- Checks all elements wired to the connector
- 16- or 24-pole connector can be selected
- Grafical or table view, can be exported as EXCEL-file via USB

Example graphical view with 24-pole connector



Example table view with 24-pole connector

Pin	Pin	Ohm	Type	Amp.	Watt	Status
1	13	100	—	2.3	530	OK
2	14	255	—	0.9	207	OK
3	15	255	—	0.9	207	OK
4	16	∞	???	-	-	Open
5	17	255	—	0.9	207	OK
6	18	1.5	GND	-	-	Short to GND
7	19	∞	???	-	-	Open
8	20	6.5	⚡	-	-	OK
9	21	7	⚡	-	-	OK
10	22	5	⚡	-	-	OK
11	23	4.6	⚡	-	-	OK

## NOLDEN MULTIFUNCTION CONCEPT

All process control functions in just one box

It has to be easy – easy to install and easy to operate! Inspired by this vision, the NOLDEN multifunction concept was born, to combine all necessary control functions in the mould as well as in the hotrunner in just one box. This means less space needed around the injection moulding machine, less wiring and simpler data management for all functions. One more advantage – the box “moves on with the mould” and can be used on every suitable injection press, this gives you more flexibility in production planning.



### COOLING

#### Detail monitoring of all cooling ducts

Effective mould cooling is key for good quality of the parts. To obtain economical cycle times, a simple bridging of all cooling ducts is often not sufficient, here, a good solution is the parallel flow of all ducts with the proven **ORCA**-cooling water distributor. Visualization and automatic alarms for all flow rates and temperatures are done directly on the NOLDEN touchscreen system.



Servo cables: Motor- and encoder cables connected to the hotrunner controller

### SERVO CONTROL

#### Servo motion control directly from the hotrunner controller

Servo drives are conquering the mould technology at a high pace, where they replace classical hydraulic or pneumatic actuators – with high speed, great precision and low maintenance needs. All common servo drives can directly be connected to NOLDEN NR8000 hotrunner controllers. Suitable as well for linear as for rotatory movements, the screen visualization mode adapts itself automatically.



### VALVE GATE CONTROL

#### Sequential control of valve gates

For large parts or thin walls, hotrunner valve gates have often to be controlled sequentially, no problem with the integrated NOLDEN valve gate control system. Operation can be either time based or based on the position of the injection press screw, also, you can program several needle movements per injection cycle. Data exchange with the press can be done via the core puller interface (EUROMAP) or with programmable in-/ and outputs.



### CAVITY MOULD

#### PRESSURE MEASUREMENT

#### Monitoring of cavity mould pressure directly on the hotrunner controller

Measuring the cavity mould pressure is now state of the art – Alas! quite expensive and often not easy to operate. With NOLDEN, just connect the pressure sensors directly to the hotrunner controller, visualization and monitoring of the pressure curves are then done on the touchscreen of the controller. Direct action sensors (in the cavity) as well as indirect action sensors (under the ejector pin) can be used, no matter from which manufacturer. Integrated monitoring system patented for NOLDEN Regelsysteme.



Indirect action sensors: Sensors for use under the ejector pin by BAUMER of Switzerland



Cavity pressure sensors: Direct action piezo pressure sensors by BAUMER of Switzerland

## TOUCHSCREEN CONTROLLER

All control and monitoring functions for the hotrunner in one device

Easy, user friendly operation is of great significance in injection moulding – so many systems and increasing complexity are a challenge for most operators.

That's why simple, intuitive operation was on top of the list when we developed the NOLDEN STS – Smart Touch System. All functions as hotrunner heating, mould cavity pressure measurement or servo motion control are operated in a similar manner – and all mould data are stored in one common recipe memory.

All touchscreen controllers NR8000 are using evoControl®, existing systems can be upgraded.

**evoControl®**



### Series NR 8000 Tower

Tower casing in 2 sizes, up to 48 or 120 zones

## COMPACT-TOUCHDEVICES

The economic alternative for temperature control

In many cases, a smaller number of temperature control zones is sufficient and complex additional functions are not needed or only required on a limited scale. Here, our compact touchcontroller NR 8000-v3 is the ideal solution: The same intuitive, user-friendly NOLDEN Smart Touch System with all features in a compact desktop casing for hotrunners from 12 up to 32 zones. Nevertheless, also for those controllers conventional valvagate control, cavity mould pressure measurement as well as cooling monitoring are available as an option.



### Series NR 8000-v3

High desktop casing for 24 or 32 zones



### Series NR 8000-v3

Desktop casing from 12 up to 16 zones



### MouldConnect T

For 24 or 48 temperature sensors, extension up to 120 zones

## MOULDCONNECT

The new, innovative mould wiring concept by NOLDEN

Perfectly matching with NOLDEN touchscreen controllers, MouldConnect simplifies drastically the wiring and connection of your mould. Just wire all temperature sensors, pressure transducers and other low voltage lines such as core pullers or proximity switches into the new MouldConnect box. From there, only 1 cable is needed to the control system.

**ONE PLUS ON TOP:** As you connect the cable to the controller, the mould is automatically identified and mould data are loaded, you simply can't do it easier!

## COMPACT-TOUCHDEVICE MINI

Comfortable touch operation also for the "little ones"



### Series NR 8000-v3 Mini

Mini-Desktop casing for 4, 6 or 8 zones

The great success of our touch controller series NR 8000 shows: This device is meeting the expectations of plastics processing professionals. That's why we created a "Mini" version for 4, 6 or 8 zones. Operation and data management are identical for all units up to 120 zones, so, transitioning between the systems is very easy. Sorry, no space left in this very compact casing for additional control functions, just cavity mould pressure measurement is available as an option. And of course, always on board is evoControl®.

**evoControl®**

## BOLT-ON CONTROLLERS

### Multizone-temperature controllers in NOLDEN quality

Often, hotrunner temperature controllers are meant to stay at one injection moulding machine, but complex hotrunner functions and precise control precision must not be missed. Here, our new bolt-on control system with separate touch monitor comes in very handy.

**evoControl®**



**Series NR 8000-v3 SGM**  
Modular hotrunner controller for 8 zones, can be extended

**Separate touchmonitor**  
With 5m cable, available in 10" or 15" screen size



## PLUG-IN TEMPERATURE CONTROLLERS AND RACKS

### The proven NOLDEN controllers – easy to operate and durable

That's how temperature control began at NOLDEN, unmatched in precision and handiness until today, now at the 7<sup>th</sup> generation in modern digital technology.

Choose from a range of mainframe racks for 2, 4 or 6 zones, with controller and signal alarm units. Compatible to all NOLDEN plug-ins ever produced, no matter which series. Just slide in the unit and switch it on, everything else is done automatically.



**Series NR 3070**  
19" Microprocessor plug-in controller with LED-display and bargraphs

## SMALL CONTROLLERS

### Economic devices for simple control operations

Beside the very precise hotrunner controllers with many additional features, a simpler device is often sufficient, e.g. for prolonged tips, welding bars or hot plates. Here, our economic small controllers such as NR 2007 are a perfect solution, available for 1 or 2 zones.



**Series NR 2007**  
Small microprocessor controller for 1 or 2 zones



## MOULD CONNECTION CABLES

Mould connection cables made to measure or out of bulk stock

Mould connection cables are needed in any case, whatever control technology is used. NOLDEN produces every cable custom-made, any length, connector type and wiring

pin assignment, at very interesting prices. Alternatively, you can order any cable type by the meter.



## INDUSTRIAL CONNECTORS

Following international standards

For the connection of moulds and hotrunners, very often standard industrial connectors are used. However, many different versions exist – heavy and narrow, 3 up to 64 poles, male and female etc..

NOLDEN has virtually every existing standard version in stock, in addition to that, numerous non-standard items, delivered within 24h to you.



**Connector housings**  
All versions available ex stock



**Connector inserts**  
With proven screw connecting or patented SQUICH quick-lock technology

## ACCESSORIES

For electrical mould heating – manufacturer independant

Often, time is short, an unplanned repair must be done and spare parts are missing. Good to know that NOLDEN has a broad assortment of thermocouples, heating

elements and connectors available ex stock. Compatible to most industries standards, independent from the brand of the injection press and at low prices.



**Thermocouples**  
In many variants for moulds and plastics processing machines



**Heating elements**  
In brass and stainless steel ex stock, many other variants available on demand



**Heating cartridges**  
In all lengths, diameters and connection variants on demand

## MOULD CONNECTION BOXES

The hands-on solution for trouble-free wiring

Every professional knows the main problem in mould wiring: lack of space! Many wires must be accommodated in the small space of a connector housing. Perhaps, even

a wiring change must be performed later on – this is where the proven NOLDEN mould connection boxes come in as a very practical solution.



**Mini mould connection box**  
In stainless steel for square mini connectors

**Mould connection box**  
NOLDEN design, 3-part-casing, simplifies the wiring of multi-pole connectors







**NOLDEN**  
**REGLER<sup>o</sup>**

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